FAA-E-2578
November 9, 1973

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION SPECIFICATION

DOPPLER VOR SIDEBAND TRANSMITTER

1. SCOPE

1.1 Scope.- The equipment specified herein is a solid state transmitter which operates over the frequency range of 108 to 118 MHz. This transmitter is intended for use in a VHF omnirange (VOR) Doppler facility as an unmodulated sideband signal source. The sideband transmitter samples the signal of a carrier transmitter (not required to be furnished under this specification) and automatically provides outputs which are nominally 9960 Hz above and below the frequency of the carrier transmitter.

2. APPLICABLE SPECIFICATIONS

2.1 Specifications issue.- The following specifications of the issues specified in invitation for bids or request for proposals form a part of this specification, and are applicable in their entirety except as specifically modified herein after.

2.1.1 FAA specifications.-

FAA-G-2100/1	Electronic Equipment, General Specification
FAA-G-2100/3	Requirements for Equipments Employing Semiconductor Devices

FAA-G-2100/4	Requirements for Equipments Employing Printing Wiring Techniques
FAA-G-2100/5	Requirements for Equipments Employing Micro-electronic Devices
FAA-G-2300	Panel and Vertical Chassis, Rack

(Copies of this specification, and of the other applicable FAA specifications, may be obtained from: Federal Aviation Administration Washington, D. C. 20591, ATTN: Contracting Officer. Requests should fully identify material desired, i.e., specification numbers, dates, amendment numbers, complete drawing numbers; also requests should identify the Invitation for Bid, Request for Proposal or Contract involved or other use to be made of the requested material).

3. REQUIREMENTS

3.1 Equipment to be furnished by the contractor.- Each sideband transmitter furnished by the contractor shall be complete in accordance with all specification requirements.

Any feature or item necessary for proper operation in accordance with the requirements of this specification shall be incorporated even though that feature or item may not be specifically described herein.

3.2 Definitions.-

3.2.1 VOR carrier transmitter frequency.- For purposes of this specification the carrier frequency is defined as 108.00 + 0.05N Megahertz where N may have any integral value from zero to 200. The carrier frequency stability is 0.002%.

3.2.2 Doppler VOR upper sideband (USB) frequency.- A frequency which is nominally 9960Hz higher than the carrier transmitter frequency. The nominal value and stability requirements are referenced to the actual carrier frequency.

3.2.3 Doppler VOR lower sideband (LSB) frequency.- A frequency which is nominally 9960Hz lower than the carrier transmitter frequency. The nominal value and stability requirements are referenced to the actual carrier frequency.

3.2.4 Single sideband (SSB) Doppler VOR.- A system in which only the carrier and upper sideband frequencies are radiated. The signals are radiated from separate antenna systems providing amplitude modulation of the carrier frequency signal in space.

3.2.5 Double sideband (DSB) Doppler VOR.- Same as 3.2.4 except that the carrier and both upper and lower sideband frequencies are radiated.

3.2.6 Sideband antenna distributor.- A device (mechanical or electronic) which commutates the output(s) of the sideband transmitter to a circular array of 50 antennas at the rate of 30 cycles per second. (In the double sideband Doppler system the two outputs are always connected to diametrically opposite antennas). The distributor represents a complex time varying load to the sideband transmitter in which 1500Hz components and harmonics thereof predominate.

3.2.7 Stray radiation.- The term "stray radiation" is defined as the emission or leakage of the fundamental frequency signal(s) from the equipment at points other than from the normal equipment output(s).

3.2.8 Spurious radiation.- The term "spurious radiation" is defined as emission on any frequency or frequencies other than that of the desired signal. Spurious radiation includes harmonic emissions, parasitic emissions, hum, noise and intermodulation products.

3.3 General functional requirements.- The equipment is intended for use in the replacement of existing tube-type equipment at Doppler VOR facilities and in the conversion of existing conventional VOR facilities to Doppler VOR. Interface requirements exist for reference carrier signal input, output signal sampling, output signal loading, and remote ON-OFF control. The equipment is required to operate either as a single sideband transmitter (3.2.4) or as double sideband transmitter (3.2.5), selectable by the operator with only minor electrical re-adjustment. Major performance parameters are response time, output signal spectrum, stability of output signal frequency and level, and phase coherency of upper and lower sideband signal outputs.

3.4 Service conditions.- The service conditions shall be those of paragraph 1-3.2.23, FAA-G-2100/1 with the ambient conditions of ENVIRONMENT II thereof.

3.5 Power source.- The equipment shall operate from single phase, 240 V, 60Hz (design center values, 1-3.2.21, FAA-G-2100/1) two-wire AC line power source.

3.6 Frequency.- The equipment shall operate over the frequency range of 108 to 118MHz. All specification requirements shall be met over this range.

3.7 Electronic devices.- All active electronic devices shall be semiconductor devices in accordance with FAA-G-2100/3 or micro-electronic devices in accordance with FAA-G-2100/5. Tubes shall not be employed.

3.8 Modular construction.- Modular construction with plug-in or easily replaceable subassemblies shall be employed throughout the equipment. Modularization shall be based on logical functional block concept. As a minimum, separate modules shall be provided for power supply, audio and video circuits, and RF circuits. Design shall be such as to minimize the average cost and number of different types of modules required for supply support. (See 3.12 for interchangeability of upper and lower sideband RF modules).

3.8.1 Printed wiring boards.- Except for critical R.F. applications (see 3.8.2) and except for controls and components specified to be located elsewhere, or where impractical from the standpoint of parts size or weight, all circuit parts shall be mounted on printed wiring boards in accordance with FAA-G-2100/4. All boards shall be of the plug-in type with suitable metal or thermosetting plastic guides and shall be keyed such that they can be inserted only in the correct receptacle and in the correct orientation for proper circuit connection. Where necessary to provide unrestricted access to all components for trouble-shooting purposes, board extender(s) shall be furnished. A minimum of one extender of each type required shall be furnished in a suitable storage space within the equipment.

3.8.2 RF modules.- RF modules shall be printed wiring boards as described in 3.8.1 except where such practice is not consistent with circuit performance requirements. RF modules shall be plug-in except that standard coaxial connectors (Type N or TNC) may be used for RF interconnection. Tuning controls shall be readily accessible when the modules are in place. Where necessary to provide unrestricted access to all components for trouble shooting purposes, extender cable(s) shall be furnished. A minimum of one extender cable of each type required shall be furnished in a suitable storage space within the equipment.

3.9 Equipment construction.- The equipment shall be constructed for mounting in a standard equipment cabinet rack (not required to be furnished under this specification). Materials and workmanship shall conform to Specification FAA-G-2300. The chassis shall be designed such that its overall depth behind the front panel does not exceed 14 3/4 inches. The chassis shall mount on a front panel no larger than size "J" (Drawing D-21140D of FAA-G-2300). The front panel

shall in all other respects conform to Drawing D-21140D except that it shall be cut out and the chassis constructed for sliding into and out of the cabinet rack on heavy duty drawer slides consisting of roller and extension assemblies, Grant Pulley and Hardware Corp., 31-85 Whitestone Parkway, Flushing 54, N.Y., Series SS 168, SS300, or equal. The slide shall support the chassis and shall in turn be supported only by attachment to the front panel. The slides shall be provided with latching stops to limit the travel of the chassis to that sufficient for complete access to the equipment components, and by intentional unlatching of the stops, to permit lifting the chassis out of the rack. A thumb or trigger operated locking device shall be provided on the front panel to secure the chassis in the closed position. The slides shall incorporate a tilting mechanism to allow for rotation and locking of the extended chassis at intervals through a minimum range of plus and minus 90 degrees. A ground cable shall be provided to insure a positive ground between the chassis and the cabinet rack frame.

3.10 Carrier reference signal.- The equipment shall operate with a carrier reference signal which is a sample of the output of a carrier transmitter (not required to be furnished under this specification). The carrier reference signal is a signal at the carrier frequency defined in 3.2.1 which is amplitude modulated (simultaneously) at the following frequencies and levels:

30Hz reference signal	28-32 percent
1020Hz identification signal	8 percent
300-3000Hz voice signal	30 percent

In addition and simultaneously with the above, the carrier reference signal may be phase modulated to a maximum deviation of 0.5 radian at the rate of 6480Hz.

All performance requirements of the sideband transmitter shall be met with a carrier reference signal of any combination of the foregoing frequency and modulation characteristics and having any level within the range of 20 milliwatts to 1 watt total power.

3.10.1 Input signal connector.- A type "N" female coaxial connector shall be provided on the rear of the transmitter chassis for connection of the carrier reference signal. The input voltage SWR shall no exceed 1.4. The reverse coupled energy of signals generated within the sideband transmitter as measured at the input signal connector shall not exceed 1 milliwatt.

3.11 AC input power and control.- (See Figure 1)
The equipment shall be designed for "on-off" control by means of an external 240 VAC control voltage (designated A' and B' in Figure 1). This voltage is present whenever the carrier transmitter is energized (and at which time its signal appears at the carrier reference input connector 3.10.1). In normal unattended operation the carrier transmitter is shut down in response to alarm indications from any one of several monitors (not required to be furnished under this specification). These include a frequency deviation monitor which will alarm if the sideband transmitter output signal(s) are out of tolerance. Upon initial starting, all elements of the system must attain performance within tolerance and monitors must stabilize within several seconds or the sytem will either shut down or transfer to a standby set of equipment. (See 3.13.3 and 3.14.4 for sideband transmitter response time).

An AC power contactor (K1 in Figure 1) shall be utilized to provide the required control action. Separate input terminals for the control voltage (A'B') and for the main power (AB) shall be provided on a barrier type terminal block on the rear of the equipment. The terminal block shall be Cinch Manufacturing Company No. 142-Y, General Products Corporation GEN-PRO 442-Y, or equal. A main power switch (S1), fuses, and indicator lights shall be provided on the equipment front panel. An isolation switch (S2) shall be provided for disabling the control voltage. This switch shall be behind the equipment front panel in a location such that it is readily accessible upon withdrawing the transmitter chassis. The switch shall be mechanically interlocked so that it is automatically closed when the chassis is rolled back into the closed position. Application of power to the transmitter circuits shall be indicated by an incandescent indicator with green lens operating at 48 volts or lower. Neon indicators with amber lenses shall be provided for indication of the presence of control voltage and main power. (The conditions of 1-3.16.5.2.1 (a) and (b) of FAA-G-2100/1 shall not apply for these applications).

3.12 Single sideband/double sideband operation.- The equipment shall be designed to provide either single sideband operation or double sideband operation. Positions shall be provided for USB and LSB RF modules. These modules shall be identical and interchangeable between the USB and LSB positions. When single sideband operation is desired, the LSB position(s) shall serve as storage space for the (unpowered) spare modules. Operational performance in the single sideband mode shall not be affected by the presence or absence of the spare (unpowered) module(s) in the LSB position(s).

3.12.1 LSB "ON-OFF" switch.- A switch with a locking feature, shall be provided within the equipment to remove D.C. power from the LSB generator module(s) when single sideband operation is desired.

3.12.2 Power output.- Each sideband generator shall be capable of providing at least 20 watts of CW power output as required for single sideband operation but shall be tested at 10 watt output for double sideband operation. In the event that the equipment power supply is not capable of furnishing the requirements of both sideband generators operating simultaneously (see 3.12.3) at maximum power output, a "high-low" switch, with a locking feature, shall be provided which reduces the range of power output available for the double sideband mode of operation. The range of power output adjustment shall be at least 5 to 20 watts in the "high" position and at least 2.5 to 10 watts in the "low" position. If a switch is not provided, the range of adjustment shall be at least 2.5 to 20 watts.

3.12.3 Power supply capacity and circuit protection.- The power supply shall either be of sufficient rating to supply the requirements of both sideband generators operating continously at maximum output (at least 20 watts each) or of supplying the lesser maximum requirements possible with the switches of 3.12.1 and 3.12.2 in the appropriate positions. In the latter case, supplemental DC fusing shall be provided, if required, to protect power supply components against the effects of inadvertent operation with the switches in the incorrect positions.

3.13 Power output level stability and control.- The power output of the sideband transmitter shall be automatically maintained at a level proportional to the level of the carrier reference signal (3.10) within the limits of the following sub-paragraph (3.13.1 through 3.13.3).

3.13.1 Power output stability (USB channel).- For any initially adjusted output level within the range of 2½ to 20 watts, and with any initial level of carrier reference signal within the range of 20 milliwatts to 1 watt, the ratio of output level of the sideband transmitter to the level of the carrier reference signal shall remain constant within ±0.25 dB. The foregoing requirement shall be met over the range of service conditions concurrent with variation in level of the carrier reference signal between +1dB and -3dB of the initial value.

3.13.2 Power output stability (LSB channel).- The requirements for power output stability of the LSB channel shall be identical to those of 3.13.1, above, except over a sideband transmitter output level of 2½ to 10 watts.

3.13.3 Power output during warm-up.- The requirements of 3.13.1 and 3.13.2 shall apply within 10 seconds after initial application of power and reference carrier signal input under any environmental condition. The reference values of power shall be as measured under Step 1 of paragraph 1-4.12 of FAA-G-2100/1. In addition, within 3 seconds after initial application of power and reference signal, the output levels shall be within ±0.5dB of the reference values. (The procedure of 1-4.12 is modified to delete reference to "fifteen minutes" in Steps 3 and 6).

3.14 Output frequencies.-

3.14.1 Automatic frequency control.- In order to produce sideband output signals having the required frequency and phase relationships (3.14.2 and 3.14.3) the equipment design shall employ an automatic frequency control (AFC) system as functionally depicted in Figure 2. In this system the frequency of each sideband transmitter is automatically controlled to maintain phase coherency between the 9960Hz beat component of the mixed sideband and carrier reference signals and a 9960Hz reference oscillator (3.14.5).

3.14.1.1 AFC direction sensing.- The design of the AFC circuit shall be such as to preclude "lock-on" at the complementary sideband frequency (USB generator producing output on the LSB frequency or vice versa).

3.14.2 Output frequency tolerances.- Each sideband output frequency shall be controlled such that the difference frequency between it and the carrier reference signal is precisely equal to the frequency of the 9960Hz reference oscillator (3.14.5) when the carrier reference signal has any frequency in its specified range (see 3.2.1).

3.14.3 USB and LSB phase relationships.- The phase of each sideband output signal shall be maintained such that there is no more than 10 degrees difference between the phase of the 9960Hz beat produced by mixture of the signal with the carrier reference signal and the phase of the 9960 Hz reference signal.

3.14.4 Output frequency response time.- The requirements of 3.14.2 and 3.14.3 shall apply within 3 seconds after initial application of power and reference carrier signal input under any environmental condition (See 3.13.3 for modification of environmental test procedure).

3.14.5 9960Hz reference oscillator.- The equipment design shall incorporate a 9960Hz reference oscillator as part of the AFC system (3.14.1). At the option of the equipment contractor, the reference oscillator may be either of the tunable frequency or fixed frequency type. The tunable frequency oscillator shall be capable of adjustment to within 1.0Hz of 9960.0Hz and shall have a stability of $\pm$10.0Hz over the range of service conditions. If the contractor elects to provide a non-adjustable oscillator, the precision and stability shall be such as to provide an output frequency of 9960.0 $\pm$1.0Hz over the range of environmental and long term variation. A type BNC test jack shall be provided at a convenient location in the equipment for the measurement of the oscillator frequency. The test jack shall provide an output of not less than 0.25 volt RMS when loaded by 1.0 megohm.

3.14.6 Output signal spectrum.- Spurious radiation components within specified frequency bands on both sides of the fundamental signal component shall not exceed the levels tabulated below:

Frequency band	Level below fundmental
30Hz through 9kHz removed	34dB
9kHz through 18kHz removed	50dB
18kHz through 27kHz removed	60dB
beyond 27kHz removed	70dB

The above requirements shall be met under all conditions, both normal and abnormal, under which the equipment produces measurable output signals. Normal conditions shall include:

(a) range of carrier reference signal frequency, level and modulation characteristic (3.10)

(b) range of power output settings (3.12.2)

(c) normal equipment tuning and adjustment.

Abnormal conditions shall include:

(a) 3dB and greater reduction in carrier reference signal input level

(b) maladjustment of transmitter tuning controls

(c) failure of crystal oscillator circuits

(d) failure of AFC circuit

Additionally, under any of the foregoing abnormal conditions, the fundamental output frequency of each sideband transmitter shall not deviate by more than ±7.2kHz from the nominal carrier frequency plus 9960Hz for the case of the USB, and no more than ±7.2kHz from the nominal carrier frequency minus 9960Hz for the case of the LSB.

3.14.7 Carrier signal isolation.- The level of the carrier reference frequency in the output of either sideband transmitter shall not exceed a level which is 34dB below the level at the input signal connector (3.10.1).

3.14.8 Cross-channel isolation.- The level of the USB signal present at the output connector of the LSB transmitter shall not exceed a level which is 40dB below the level of USB signal present at the output connector of the USB transmitter and vice versa.

3.14.9 Frequency crystal units.- (See also 1-3.16.17 of FAA-G-2100/1). Crystal units shall be of the plug-in, non temperature controlled type. (The use of ovens is prohibited).

3.14.9.1 RF oscillator circuit crystals.- Each sideband transmitter shall employ a crystal unit (3.14.9) to establish the center of range of fine frequency control provided by the AFC circuit (3.14.1).

Each equipment shall be furnished with a set of (2) crystals units installed for operation with the assigned carrier frequency (3.2.1). The Government will advise the equipment contractor of the assigned carrier frequency for each equipment on order, no later than 90 days in advance of the scheduled date for testing of the equipment. In addition, the contractor shall provide "edge of band" and "center of band" crystal for test purposes.

With crystal units of the specified type and output frequency installed in the oscillator circuit, it shall be possible to tune and adjust the transmitter to meet all performance requirements of this specification on any one of the 200 different channels utilizing

only the integral meters required under 3.17 and without the use of frequency measurement equipment. Subject to the foregoing limitations, it shall be permissible to utilize a trimmer capacitor in the crystal circuit to optimize circuit performance for deviations from nominal of the characteristics of a particular crystal unit within its specified allowable range.

3.15 RF output circuit.- The sideband transmitter output circuits shall be designed to deliver rated power into a 50 ohm unbalanced load. Type "N" female output jacks shall be provided on the rear of the equipment for connection of the output transmission lines. All performance requirements shall be met with the output terminated in a time varying complex (capacitively reactive) impedance at the end of a type RG-214/U coaxial test cable not to exceed 20 feet in length. The time averaged VSWR presented by the impedance shall be 2.5 or greater and the maximum instantaneous VSWR shall be 3.5 or greater. (See 3.2.6. The foregoing requirement shall be considered as having been met if demonstrated by means of square wave modulation of the reactive component of the test load impedance at a 1500Hz rate). The requirements shall be demonstrated with variation in electrical length of test cable through $\pm\frac{1}{4}$ wavelength. The transmitter shall not be required to operate within specification limits for larger values of VSWR, however no parts of the equipment shall be damaged as the result of any degree of mismatch, including open and short circuits of any point on the external transmission line.

3.15.1 RF output to monitor equipment.- A portion of the output of each sideband generator shall be coupled from the final amplifier stage and provided at a type BNC female output jack (one for USB and one for LSB) located on the rear of the equipment for connection to the input of a Frequency Deviation Monitor (not required to be furnished under this Specification) having a VSWR of 1.5 at 50 ohms. The available output shall be at least 50 milliwatts for any setting of the main transmitter output (3.12.2). (An adjustable coupling probe maybe utilized). The coupling factor (ratio of RF output level at the main output jack to signal level at the monitor jack) shall not vary more than $\pm$0.5dB over the service conditions.

3.16 Stray radiation.- With the equipment operating at maximum transmitter output in either the SSB or DSB mode, stray radiation (3.2.7) shall not exceed a level of 2.0 microwatts effective radiated power. This requirement shall be met with the equipment in or out of the cabinet.

3.17 Tuning and adjustment.- All tuning, adjustment, and verification of proper operating levels of the equipment shall be accomplishable through the use of integral meters (except for the measurement of transmitter power output which uses an RF wattmeter in the output transmission line, not required to be furnished under this Specification). With the appropriate frequency crystal units (3.14.9.1) installed and with a carrier reference input signal of prescribed tolerances, it shall be possible to tune all RF circuits and adjust all required D.C., audio, and RF operating levels through voltage or current indications on the meters provided. At least two meters (one for RF tuning and a second for other signal and voltage levels) with meter selector switches shall be provided. (A single cable and plug arrangement maybe employed to connect the RF tuning meter to either the USB and LSB generator circuits). The meters and selector switches shall be mounted on a tilted panel behind the equipment front panel.

3.17.1 Effect of RF circuit detuning.- RF circuit components shall not be damaged as the result of deliberate or inadvertent maladjustment of tuning and level controls over their full range of adjustment.

3.18 Corrective maintenance.- When the supplier of equipment to this specification is concurrently required to develop corrective maintenance procedures for the equipment, as for equipment maintenance manuals or in conjunction with a maintainability program (3.20), such procedures shall be capable of accomplishment using only the Government furnished VOR station test equipment listed hereunder in addition to the internal equipment features (3.17).

a) VTVM, HP Model 410B. or equal

b) Volt-Ohmeter, Triplett 630 NA, or equal

c) RF Wattmeter, Bird Model 4301, or equal

d) RF load, 50 watt, Bird Model 8130, or equal

e) Oscilloscope, DC to 100 kHz; modified for direct application of 108-118MHz to deflection plates, Dumont Model 2559 or equal

f) Audio oscillator, HP Model 200 AB, or equal

g) Transistor tester, Abbey Model TT-22, or equal

h) Digital frequency counter, 0 to 1.0 MHz

3.19 Reliability program.- When specified in the equipment contract, the contractor shall conduct a reliability program as described in 1-3.19 of FAA-G-2100/1. The specified mean time between failure (MTBF) of the equipment, when operating as a double-sideband generator, shall be 2500 hours.

3.19.1 Full program option.- The full program shall include demonstration testing (4.5).

3.19.2 Limited program option.- The limited program shall be the same as 3.19.1, above, except less demonstration testing (4.5).

3.20 Maintainability program.- When specified in the equipment contract, the contractor shall conduct a maintainability program as described in 1-3.20 of FAA-G-2100/1. The program shall include a demonstration phase (4.6) and shall establish that the following requirements are met:

(a) The mean time to repair (MTTR) shall be not more than 30 minutes. In addition, 90 percent of all repairs shall be accomplished in not more than 45 minutes, and no single repair shall require more than 90 minutes.

(b) The preventive maintenance time (MPMT) shall not exceed 15 minutes in 2500 hours of operation.

4. QUALITY ASSURANCE PROVISIONS

4.1 General.- See Section 1-4 of FAA-G-2100/1. Unless otherwise specified each equipment shall be tested in double sideband operation and in single sideband operation (see 3.12). Production tests shall include operational tests of both sets of modules (sequentially) in single sideband operation. In the interest of expediting completion of design qualification tests (4.2) such tests may be conducted concurrently on the first two(2) production equipments (modifies 1-4.3.2 and Type-Test Groups I and II of Table I of FAA-G-2100/1).

4.2 Design qualification tests.- (See also 1-4.3.2 of FAA-G-2100).

4.2.1 Normal test conditions.- The following design qualification tests shall be conducted under normal test conditions except for line voltage variation where indicated. Unless otherwise specified, each test shall be conducted at three(3) RF input frequencies, 108MHz, 113MHz, and 118MHz.

TEST	PARAGRAPH
Carrier reference signal phase modulation	3.10
Input signal connector	3.10.1
Effect of presence of spare module	3.12
Power supply capacity and circuit protection (max. and min. input line voltage; 113MHz input frequency)	3.12.3
Power output during warm-up (max. and min. input line voltage)	3.13.3
Output frequency response time (max. positive and negative carrier frequency deviation)	3.14.4
Output signal spectrum	3.14.6
Carrier signal isolation	3.14.7
Cross channel isolation	3.14.8
RF output circuit	3.15
Stray radiation (113MHz)	3.16
Tuning and adjustment	3.17
Effect of RF circuit detuning	3.17.1

4.2.2 Service conditions.- These tests shall be identical to those of 4.3.2, service condition, type test, except conducted with the transmitter adjusted for SSB operation. The power output at the reference level of carrier signal input shall not be less than 20 watts under any test condition.

4.3 Type tests.- The following tests shall be conducted on the assigned frequency for the equipment selected.

4.3.1 Normal test conditions.- The following tests shall be conducted under normal test conditions except for line voltage variation where indicated.

TEST	PARAGRAPH
Power output during warm-up (max. and min. input line voltage)	3.13.3
Output frequency response time (max. positive and negative carrier frequency deviation)	3.14.4

4.3.2 Service conditions.- The following type tests shall be made while subjecting the equipment to the test procedure described under 1-4.12 of FAA-G-2100/1 (except see 3.13.3 and 3.14.4). The transmitter shall be adjusted for DSB operation. The power output at the reference level of carrier signal input shall not be less than 10 watts under any test condition. Tests marked by asterisk(*) shall be performed at 208, 240, and 276 VAC line voltage input.

TEST	PARAGRAPH
Carrier reference frequency variation	3.10
Power output (10 watt minimum)*	3.12.2
Power output stability and control *	3.13.1 and 3.13.2
Power output during warm-up	3.13.3
Output frequency tolerances*	3.14.2
USB and LSB phase relationship*	3.14.3
Output frequency response time	3.14.4
9960Hz reference oscillator*	3.14.5
Output signal spectrum	3.14.6
Monitor output level stability	3.15.1

4.4 Production tests.- The following production tests shall be made. Tests shall be conducted on the assigned carrier frequency.

TEST	PARAGRAPH
Carrier reference signal level and frequency variation	3.10
Control circuit operation	3.11
LSB "ON-OFF" switch	3.12.1
Power output range of adjustment (DSB operation)	3.12.2
Power output range of adjustment (SSB operation, including spare modules)	3.12.2
Power output stability and control	3.13.1 and 3.13.2
Output frequency tolerances	3.14.2
USB and LSB phase relationships	3.14.3
9960Hz reference oscillator	3.14.5
Output signal spectrum ($\pm$9kHz through $\pm$50kHz)	3.14.6
Monitor output level	3.15.1
Tuning and adjustment	3.17

4.5 Reliability demonstration test plan.- The reliability demonstration test plan shall be Test Plan V, of MIL-STD-781. The test shall be conducted under normal test conditions except for daily cycling of input line voltage and daily "on-off" switching.

4.6 Maintainability demonstration test plan.- The contractor shall design and implement a maintainability demonstration plan such that the probability of the Government accepting an equipment that does not meet MTTR and MPMT requirements does not exceed 0.1. The contractor shall design plans whereunder fault simulation for corrective maintenance tasks shall be performed by the introduction of faulty parts, deliberate misalignment and "bugging" as specified

in MIL-STD-471. Preventive maintenance will not be charged against MTTR. Further, the contractor may assume that time-to-repair data will not include logistic delay, i.e., maintenance personnel, parts and tools are available at the site. The contractor shall demonstrate MTTR (corrective maintenance) by applying Method 4 (90 percent confidence) from MIL-STD-471 using the fault simulation time-to-repair data.

5. PREPARATION FOR DELIVERY

5.1 General.- Unless otherwise specified in the contract, the equipment shall be prepared for domestic shipment in accordance with the following subparagraphs.

5.2 Preservation and packaging.- Preservation and packaging shall be in accordance with Specification MIL-E-17555, Level A.

5.3 Packing.- Packing shall be in accordance with Specification MIL-E-17555, Level B. No more than one transmitter and associated items shall be packed in each shipping container.

5.4 Marking.- Each package and shipping container shall be durably and legibly marked with the following information:

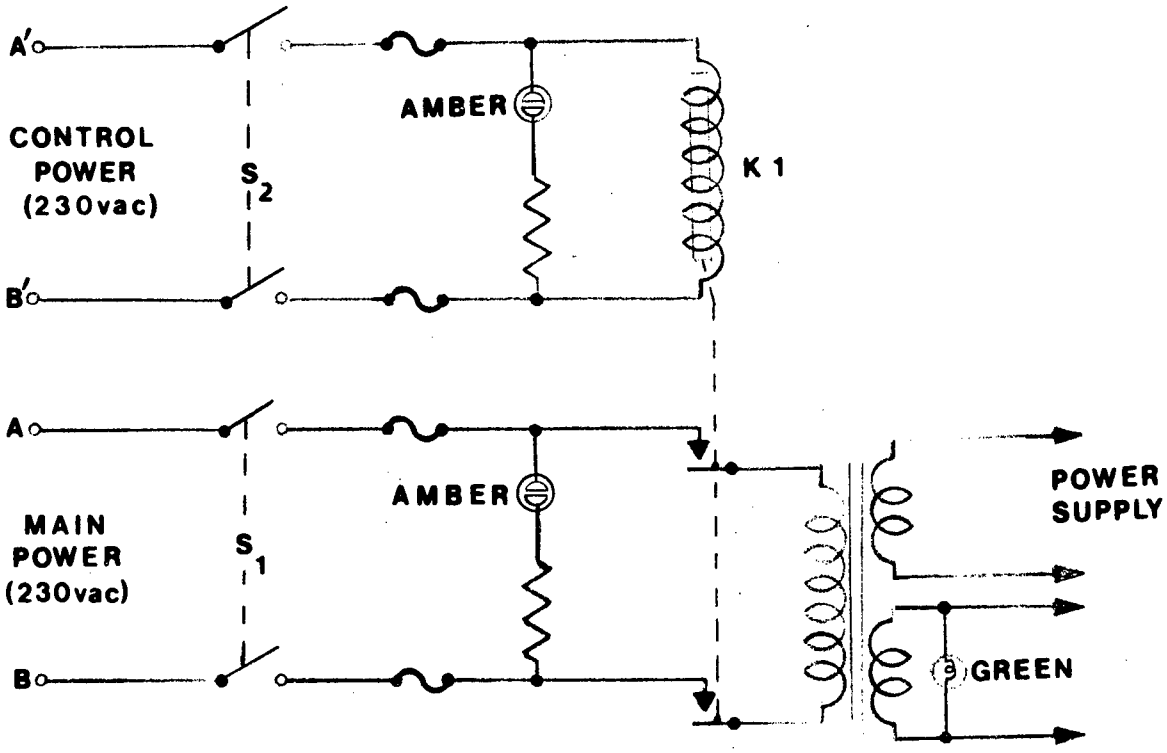
Name of Item and FA Designation
Serial Number
Quantity
Contract Number
Federal Stock Number
Gross Weight of Container
Manufacturer's Name

6. NOTES

6.1 None

* * * * *

FOR FIGURES 1 TO 2, SEE PAGES 17 TO 18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(230vac)
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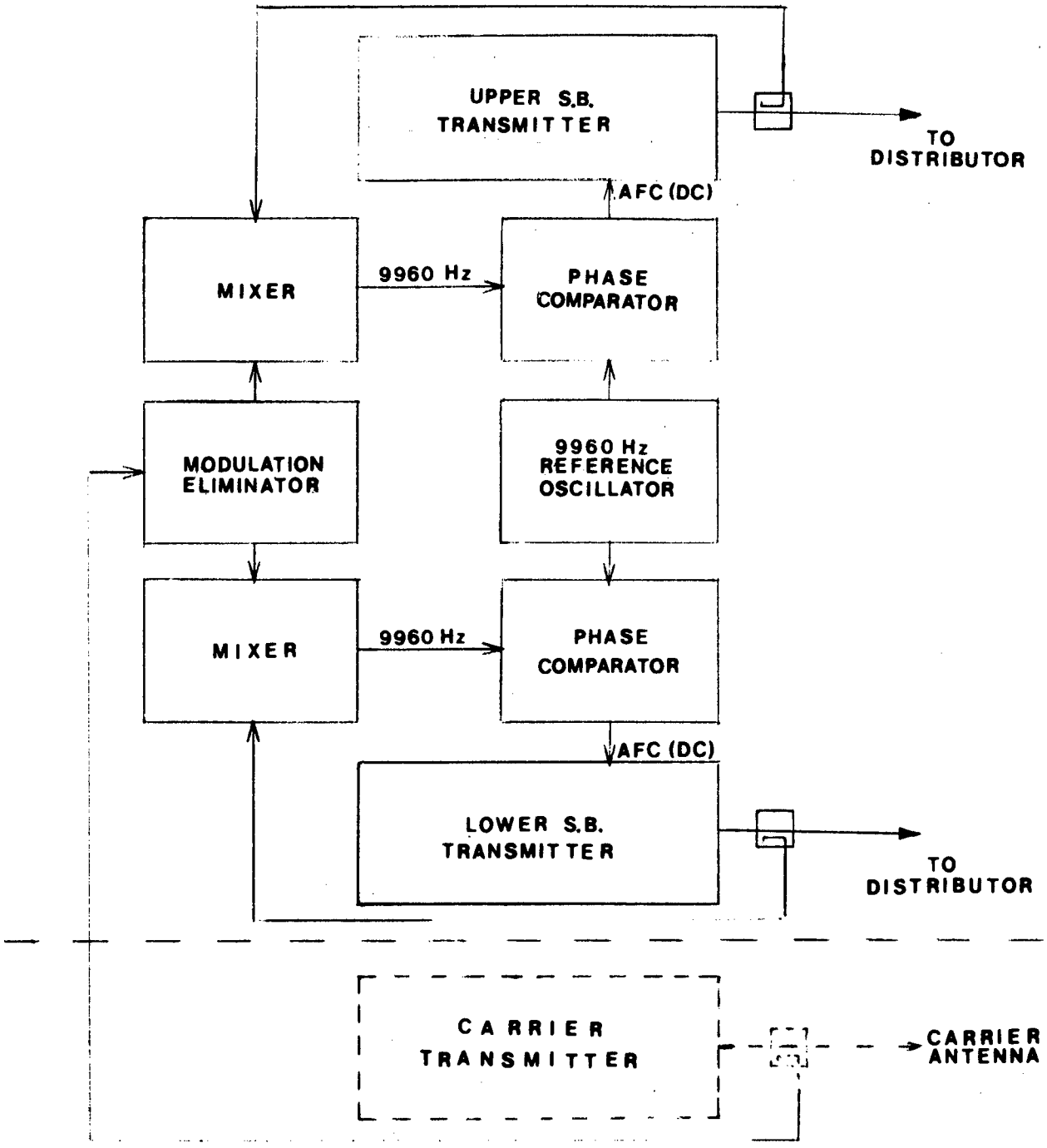
POWER
SUPPLY
GREEN

FIGURE 1



FUNCTIONAL BLOCK DIAGRAM
AFC SYSTEM
FIGURE 2

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